

1 HCI and the Web

1.1 HCI – A Quick Reminder

1.2 Web Technology – A Brief Overview

1.3 Web Usability

1.4 Designing Web Sites for Usability

1.5 Web Accessibility

Literature:

- Jakob Nielsen: Designing Web Usability, New Riders 2000
- Steve Krug: Don't Make Me Think, New Riders 2006 (2nd ed.)
- Shneiderman, Plaisant: Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition)

Steve Krug: Design and Reality

WHAT WE DESIGN FOR... **THE REALITY...**

Read
Read
Read
Read
[Pause for reflection]
Finally, click on a carefully chosen link

Look around feverishly for anything that
a) is interesting, or vaguely resembles what you're looking for; and
b) is clickable.
As soon as you find a halfway-decent match, click.
If it doesn't pan out, click the Back button and try again.

<http://www.sensible.com/chapter.html>

Steve Krug: We Don't Read Pages, We Scan Them

- We are in a hurry.
- We know that we do not have to read everything.
- We are educated in scanning things.

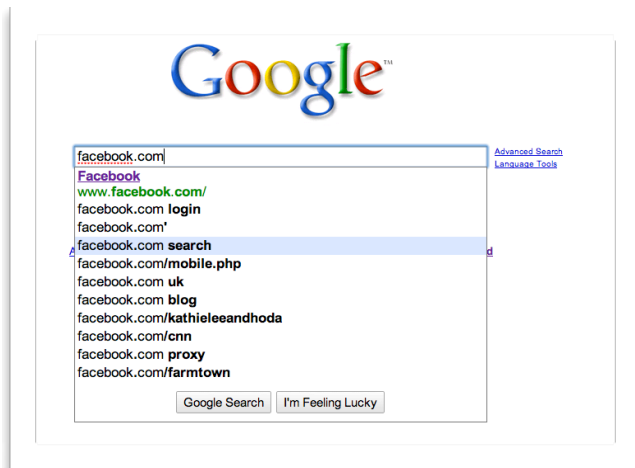


Steve Krug: We Satisfice (satisfying & sufficing)

- We do not make optimal choices
 - We are in a hurry
 - There is not much penalty for guessing wrong
 - Weighing options does not guarantee success
 - Guessing is more fun
- Gary Klein: Sources of Power - How People Make Decisions
 - Example: Fire commanders do rarely compare options!
 - » Find a reasonable plan
 - » Check it for obvious problems
 - » Try it!

Steve Krug: We Muddle Through

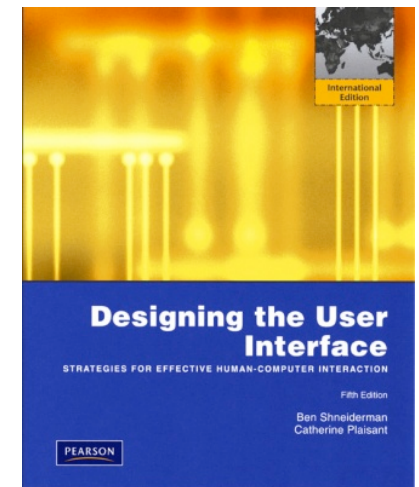
- Users in general do not care **how** and **why** things work
 - Any working solution is accepted
 - We do not have the time to analyze the details
 - There is no incentive for having it understood better
- Example:
 - Use a search box for navigating to a site!



Quality of Service

Introduction

- 1960s: mathematical computation associated with computation time
- World wide web: means graphics, & network congestion effect response time
- Time is precious
 - Lengthy or unexpected system response time can produce:
 - frustration
 - annoyance
 - eventual anger



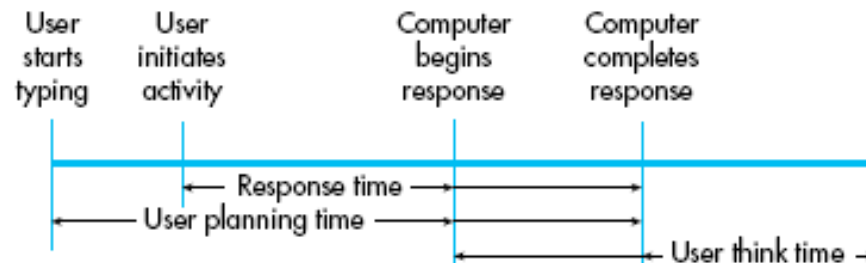
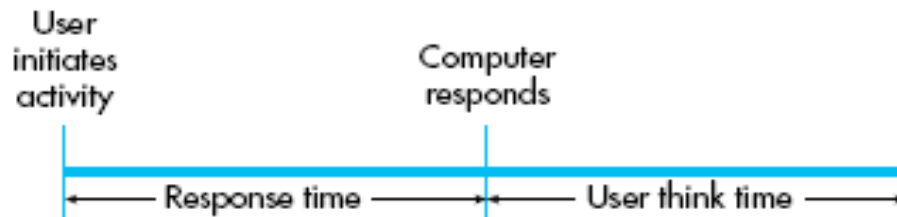
Models of Response-time Impacts - System vs. User

Response time

- The number of seconds it takes from the moment users initiate an activity until the computer presents results on the display

User think time

- The number of seconds the user thinks before entering the next action



Models of Response-time Impacts - Sources

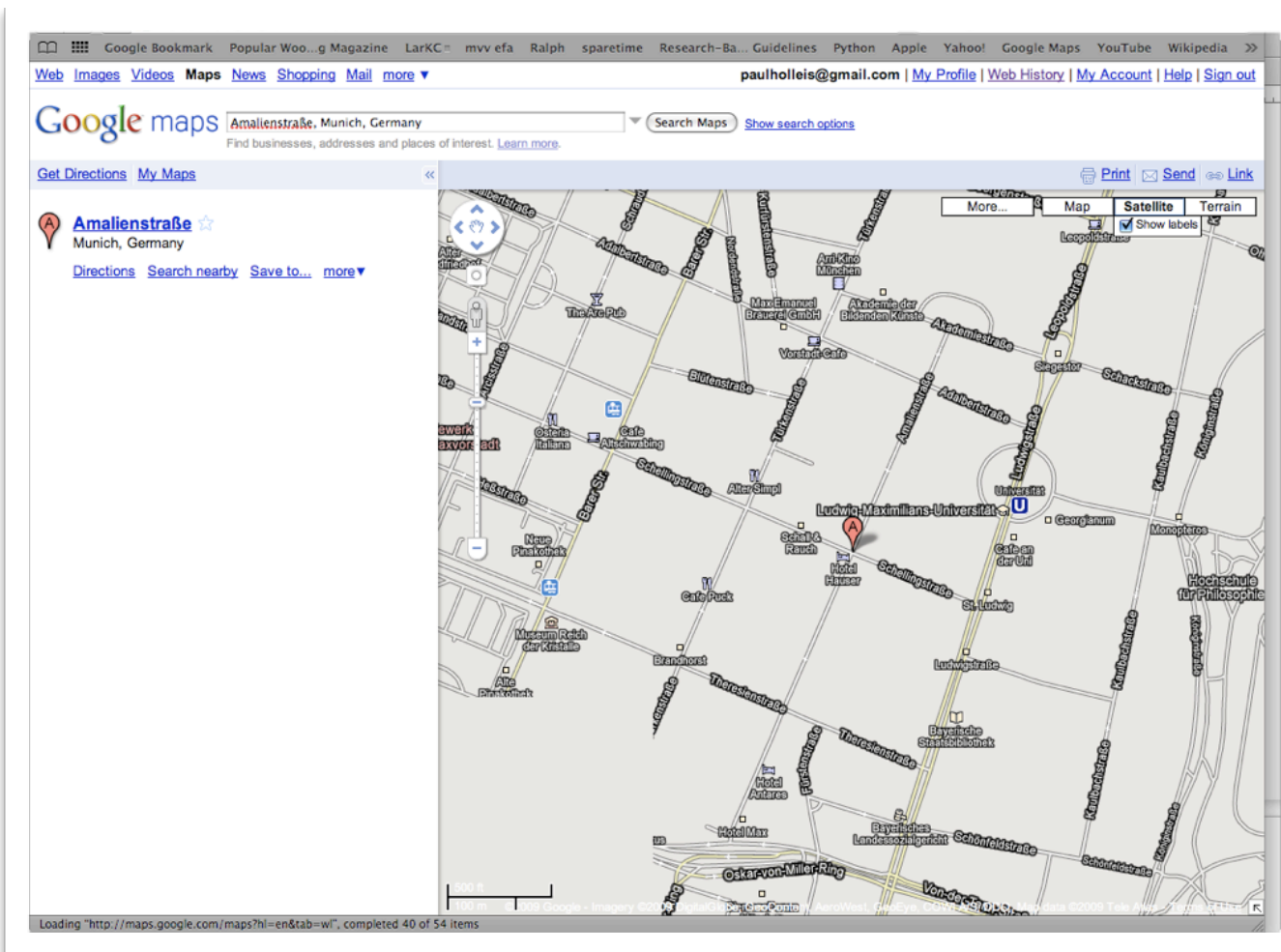
Designers of response times and display rates in HCI must consider:

- complex interaction of technical feasibility
- cost
- task complexity
- user expectations
- speed of task performance
- error rates
- error handling procedures

Overall majority of users prefer rapid interactions

- Lengthy response times (15 seconds) are detrimental to productivity
- Rapid response times (1 second or less) are preferable, but can increase errors for complex tasks

Tune World Wide Web Applications to Improve Performance



Designers can optimize web pages to reduce byte counts and numbers of files or provide previews of materials available in digital libraries or archives to help reduce the number of queries and accesses to the network

Models of Response-time Impacts - Memory

Any cognitive model must emerge from an understanding of human problem-solving abilities

Magic number seven - plus or minus two

- The average person can rapidly recognize 7 chunks of information at a time
- This information can be held for 15 to 30 seconds in short-term memory
- Size of the chunks depends on the person's familiarity with the material

Short-term memory and working memory are used in conjunction for processing information and problem solving

- Short-term memory processes perceptual input
- Working memory generates and implements solutions

People learn to cope with complex problems by developing higher-level concepts using several lower-level concepts brought together into a single chunk

Short term and working memory are highly volatile

- Disruptions cause loss of memory
- Delays require that memory be refreshed

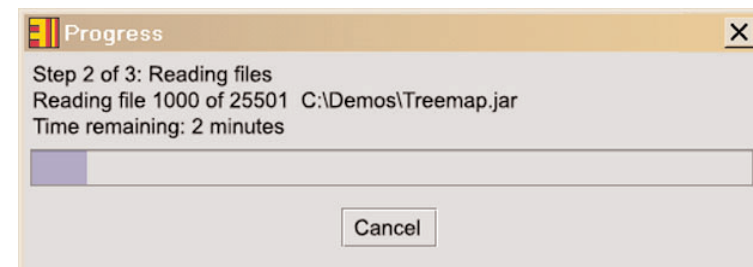
Models of Response-time Impacts - Source of errors

Longer response time causes uneasiness in the user because the penalty for error increases

Shorter response time may cause the user to fail to comprehend the presented materials

Progress indicators shorten perceived elapsed time and heighten satisfaction:

- graphical indicators
- blinking messages
- numeric seconds left for completion



Models of Response-time Impacts - Explanations

Rapid task performance, low error rates, and high satisfaction can come from:

- Users have adequate knowledge of the objects and actions necessary for the problem-solving task
- The solution plan can be carried out without delays
- Distractions are eliminated
- User anxiety is low
- There is feedback about progress toward solution
- Errors can be avoided or handled easily

Other conjectures in choosing the optimum interaction speed

- Novices may exhibit better performance with slower response time
- **Novices prefer to work at slower speeds**
- **With little penalty for an error, users prefer to work more quickly**
- When the task is familiar and easily comprehended, users prefer more rapid action
- **If users have experienced rapid performance previously, they will expect in future situations**

User Productivity

Repetitive tasks

- Nature of the task has a strong influence on whether changes in response time alter user productivity
- Shorter response time means users responds more quickly, but decisions may not be optimal
- Goodman and Spence (1981) – reduced response time lead to more productivity
- Teal and Rudnecky (1992) – slower response time lead to more accuracy

Problem solving tasks

- Users will adapt their work style to the response time
- Users will change their work habits as the response time changes
- Grossberg, Wiesen, and Yntema (1976) – the time to solution was invariant with respect to response time

Summary

- Users pick up the pace of the system to work more quickly with shorter response time
- Higher throughput of work demands more attention must be paid to minimizing the cost of delay of error recovery

Frustrating Experiences and Countermeasures

(Ceaparu et al., 2004) 46% to 53% of users' time was seen as being wasted

Since frustration, distractions, and interruptions can impede smooth progress, design strategies should enable users to maintain concentration.

Three initial strategies can reduce user frustration:

- Reduce short-term and working memory load
- Provide information abundant interfaces
- Increase automaticity
 - Automaticity in this context is the processing of information (in response to stimuli) in a way that is automatic and involuntary, occurring without conscious control.
 - An example is when a user performs a complex sequence of actions with only a light cognitive load, like a driver following a familiar route to work with little apparent effort.

Expectations and Attitudes

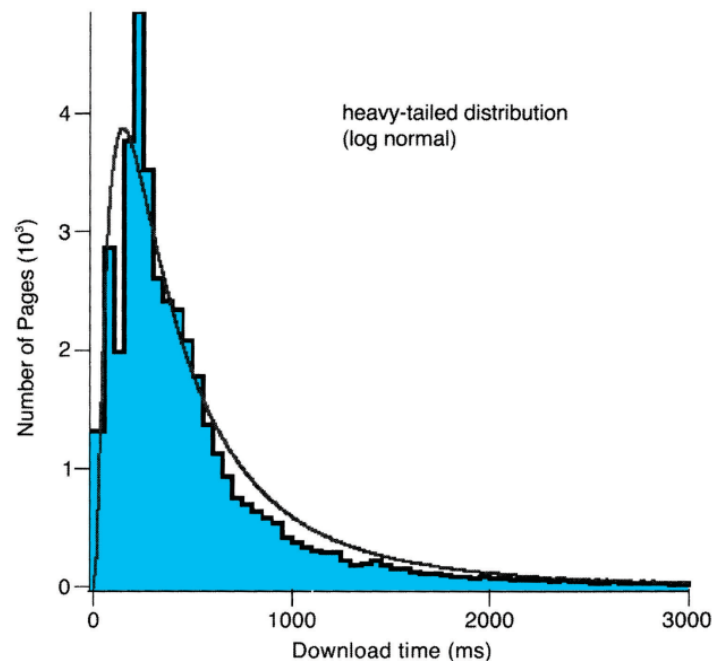
Related design issues may clarify the question of acceptable response time

- E.g. how long before hearing a dial-tone

Two-second limit (Miller, 1968) appropriate for many tasks

But users have adapted a working style and expectation based on responses within a fraction of a second

People can detect 8% changes in a 2-4 second response time



Expectations and Attitudes - Measures

Response-time choke:

A system is slowed down when the load is light and potential performance high

Makes the response time more uniform over time and across users, avoiding expectations that can't always be met

Response time across web sites varies

It effects user interest and quality assessment

Three things influence response-time:

- Previous experiences
- The individual's tolerance for delays
- Task complexity

Planning a Web site

Identifying goals, objectives, users,...

Target audience

- Usually multiple groups

Describe briefly the main purpose of the site

- About one paragraph

Outline the main objectives of the site

- If possible 5 or less

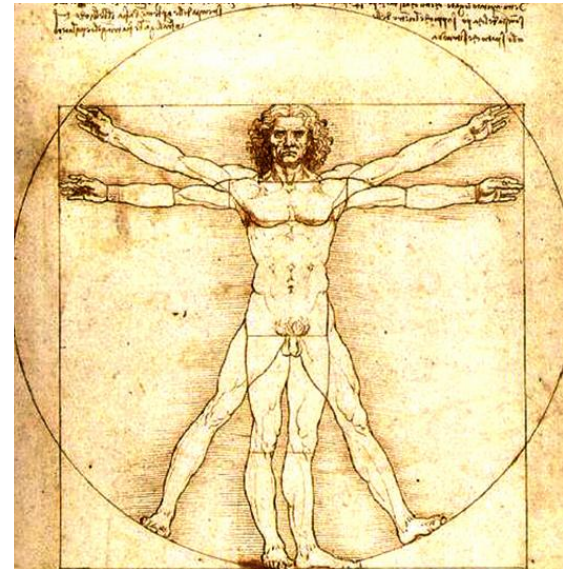
Specify the information that will be provided on the site

Define success criteria for the web site

Designing Web Pages – Example

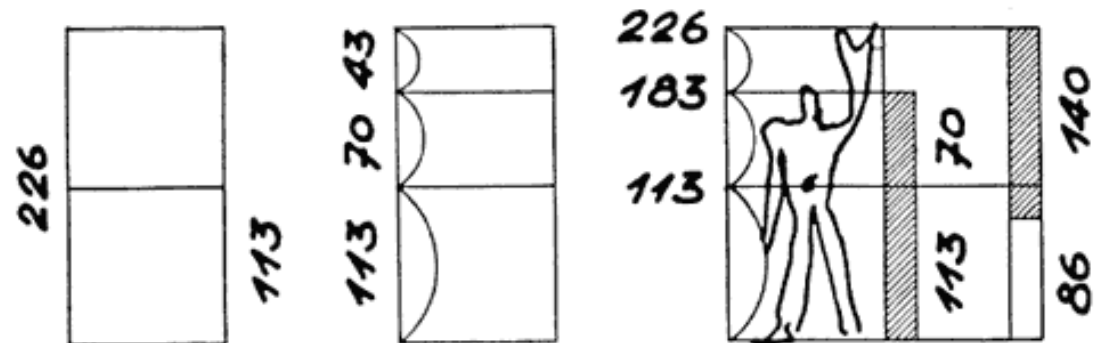
Grids for Design

http://www.subtraction.com/pics/0703/grids_are_good.pdf



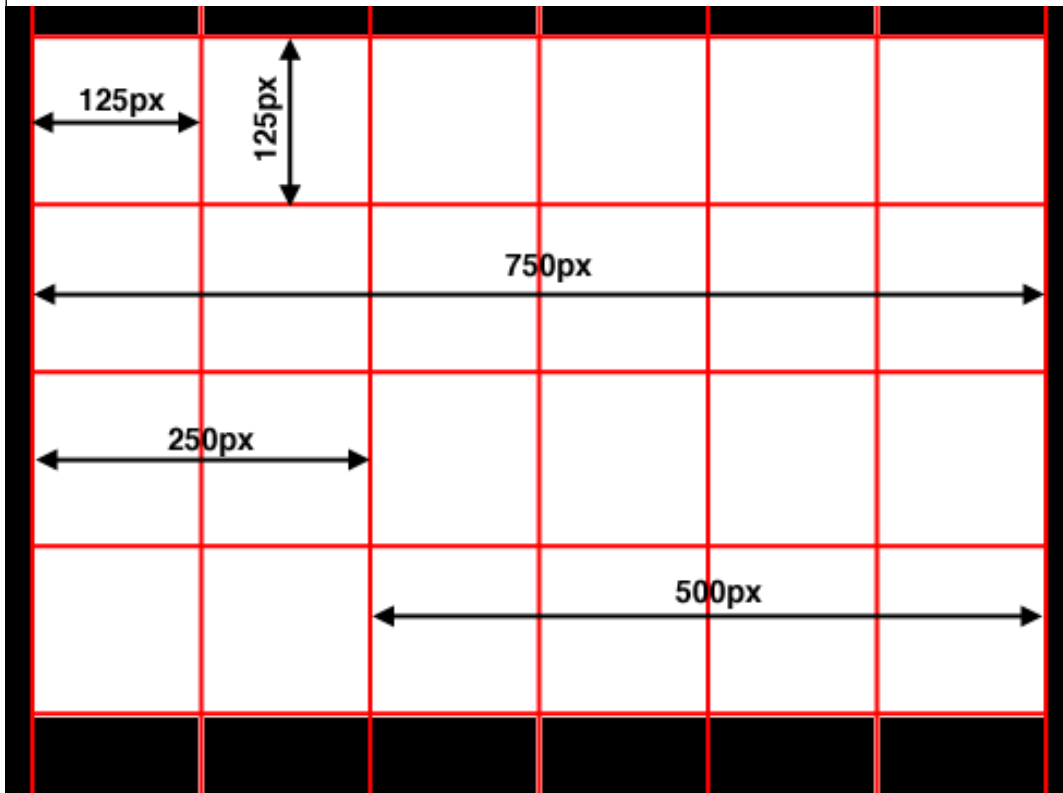
Leonardo DaVinci,
"The Vitruvian Man" 1492.

Le Corbusier, "Modulor" 1948.

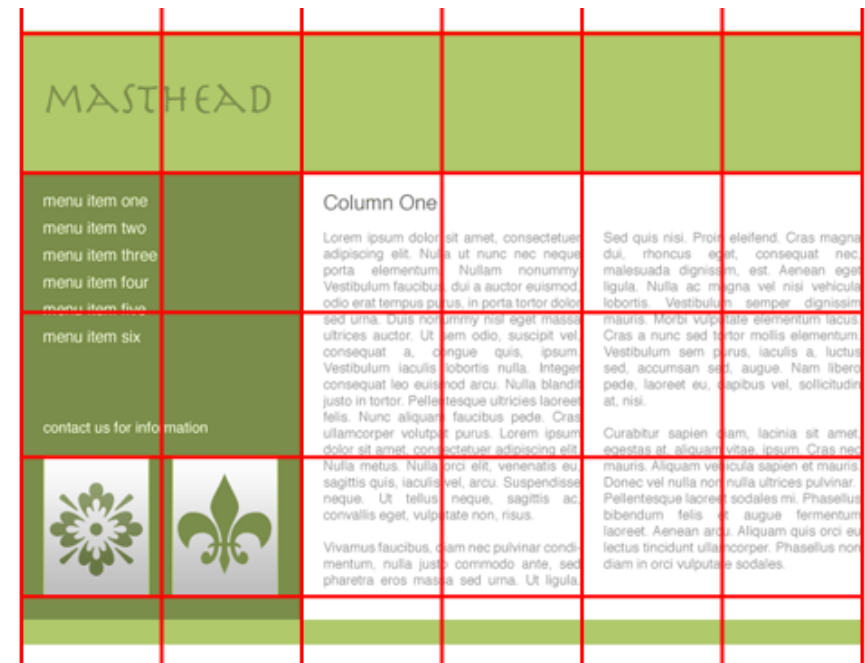


From: <http://www.marcus-frings.de/text-nnj.htm>

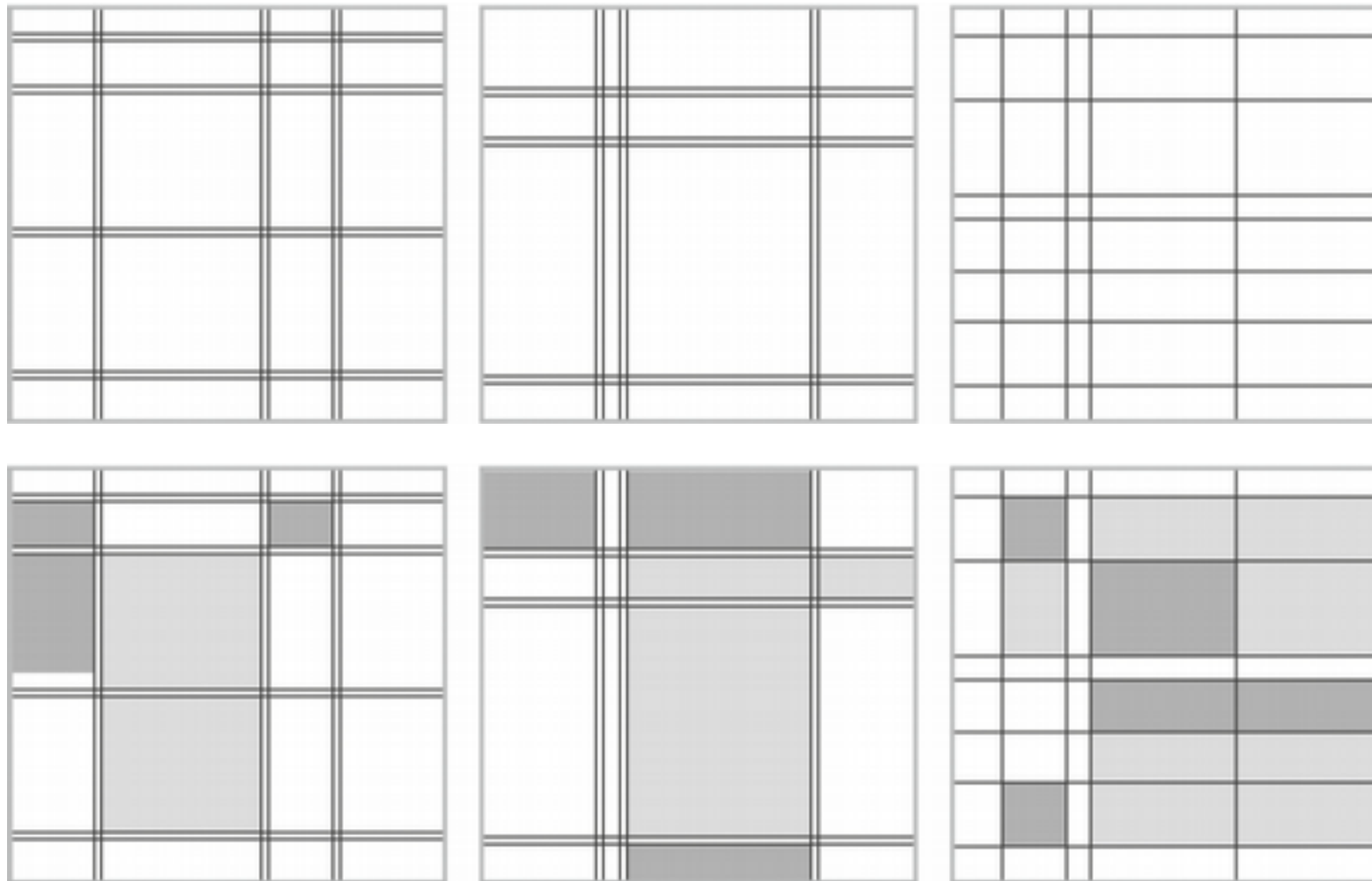
Raster: basics



<http://www.brightlemon.com/web-design/blog/?m=200705>

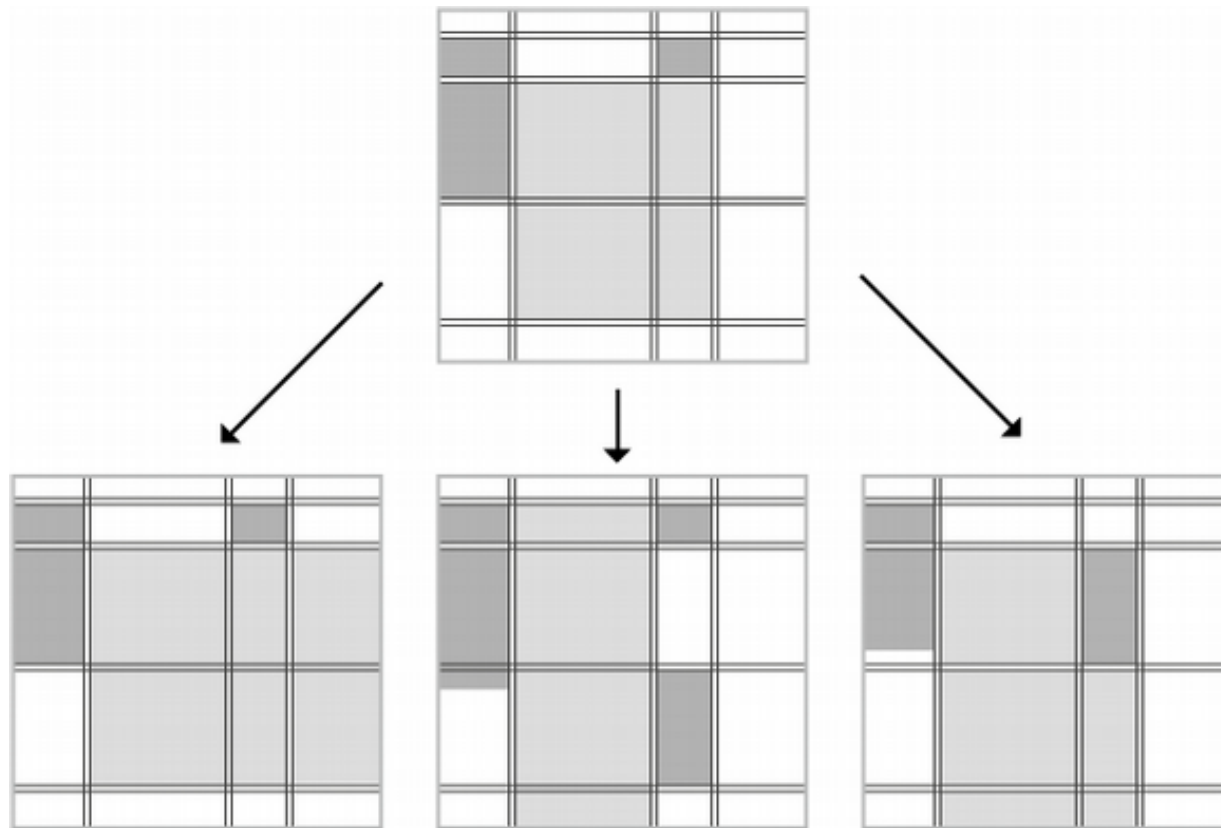


Grids as Design Guidelines - Examples



<http://www.webmasterpro.de/design/article/gestaltungsraster-fuer-webseiten.html>

Grid, creating a page family



Several pages in the web site base on the same grid – but using different areas in different pages

<http://www.webmasterpro.de/design/article/gestaltungsraster-fuer-webseiten.html>

Jakob Nielsen's Alertbox, October 3, 2005 and update 2007: Top Ten Web Design Mistakes of ...

2005

1. Legibility Problems (small font size, low contrast)
2. Non-Standard Links
3. Flash
4. Content That's Not Written for the Web
5. Bad Search
6. Browser Incompatibility
7. Cumbersome Forms
8. No Contact Information or Other Company Info
9. Frozen Layouts with Fixed Page Widths
10. Inadequate Photo Enlargement

2007

1. Bad Search
2. PDF Files for Online Reading
3. Not Changing the Color of Visited Links
4. Non-Scannable Text
5. Fixed Font Size
6. Page Titles With Low Search Engine Visibility
7. Anything That Looks Like an Advertisement
8. Violating Design Conventions
9. Opening New Browser Windows
10. Not Answering Users' Questions

<http://www.useit.com/alertbox/9605.html>

How to assess usability?

- Use potential errors to create a checklist
 - Use expert evaluation and checklist to assess the usability
 - Analyses of use (log files)
 - Heuristic evaluation
 - User studies
-
- See MMI1

Nielsen's Usability Engineering Life Cycle

Pre-Design Phase:

- Conduct a field study on how users work in their environment.
- Run a small user test analysis on the old design
- Make a comparative user test on competing web sites.

Design Phase:

- Use parallel design to make simple prototypes of different design approaches.
- Select the best design from the previous step and develop it further, then do more user testing.
- Iterate this design as many times as your time and budget allows.
- Almost finish site and do one market test.

Post-Design Phase:

- Get statistics and feedback about real use of the web site.
- Refresh your web site (minor changes).
- Start planning for the next redesign of the web site

Web Design - See Books

Many books available,

- E.g. Mutz et al. Web Creative
- E.g. Götz, Raster für das Webdesign



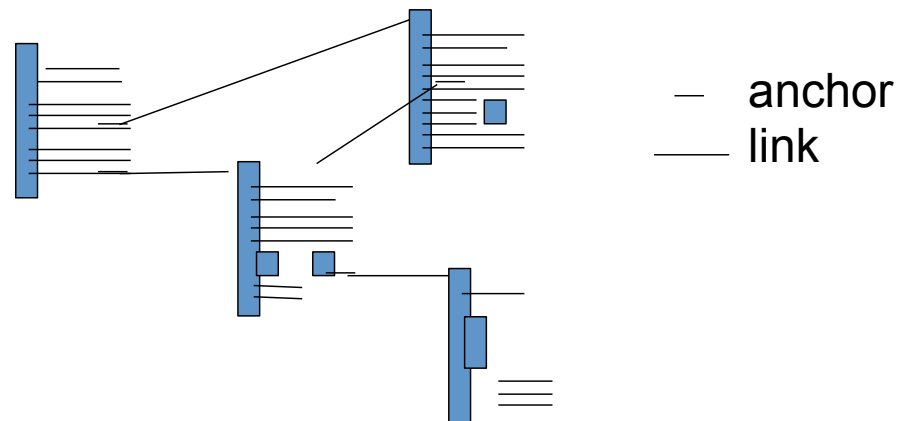
Hypertext Components

Structure

- hypertext document: directed graph

Components

- node: information unit
- anchor: Information chunk within a node, target for a link
- link: connections between nodes



Node

Single media nodes

- only one media type per node

Mixed media nodes

- different media types possible per node
- alternatives, combination

Systems with limited content size

- no internal navigation
- e.g. HyperCard

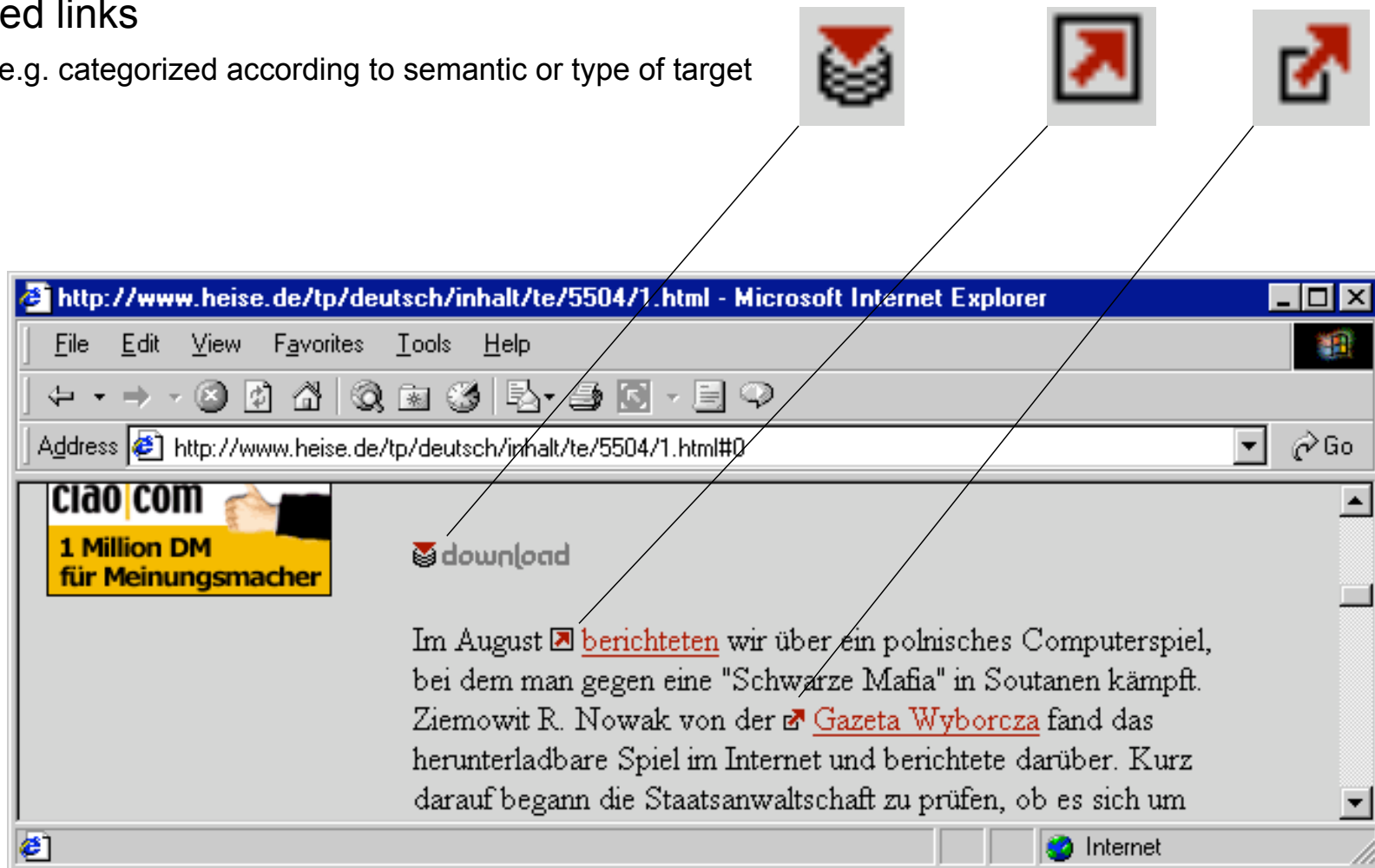
Systems with unlimited content size

- internal navigation necessary
- e.g. scrolling

Links

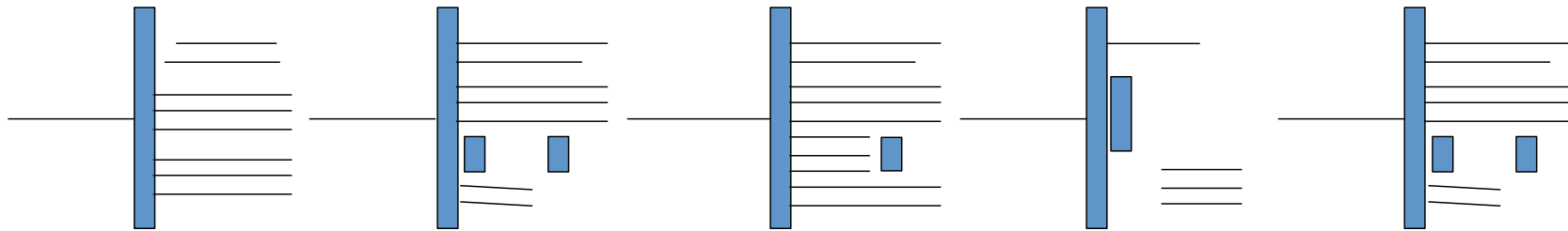
Information content of a link

- simple (untyped) links
- typed links
 - e.g. categorized according to semantic or type of target



Linear Structures I

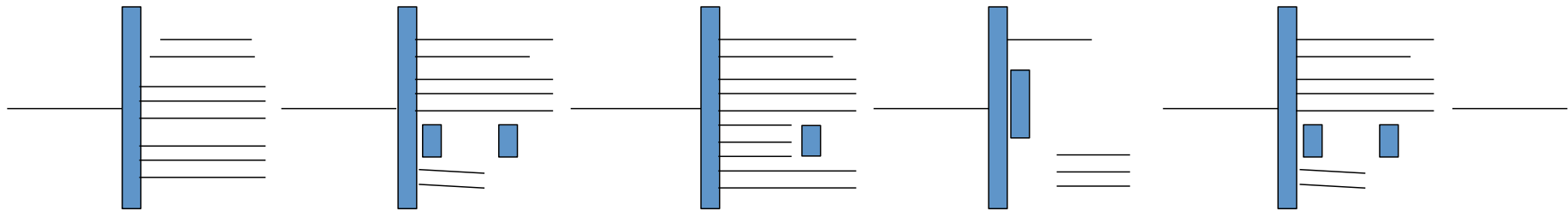
pure linear



strict guidance (directed)
little choices for the user
pre-caching possible

Linear Structures II

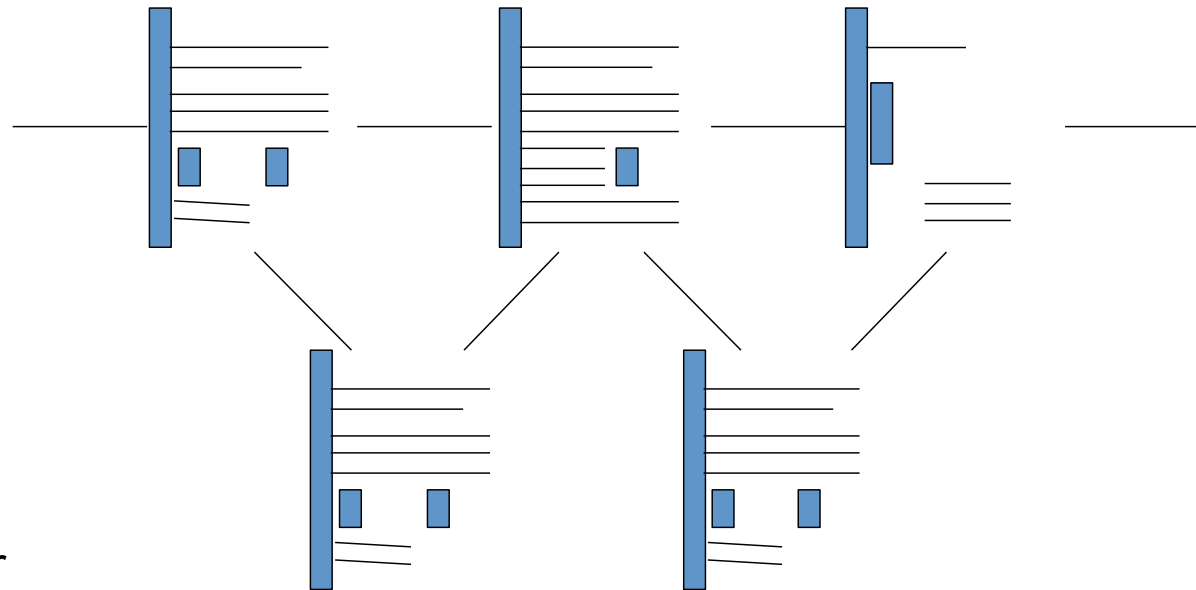
pure linear



strict guidance
little choices for the user
pre-caching possible

Linear Structures III

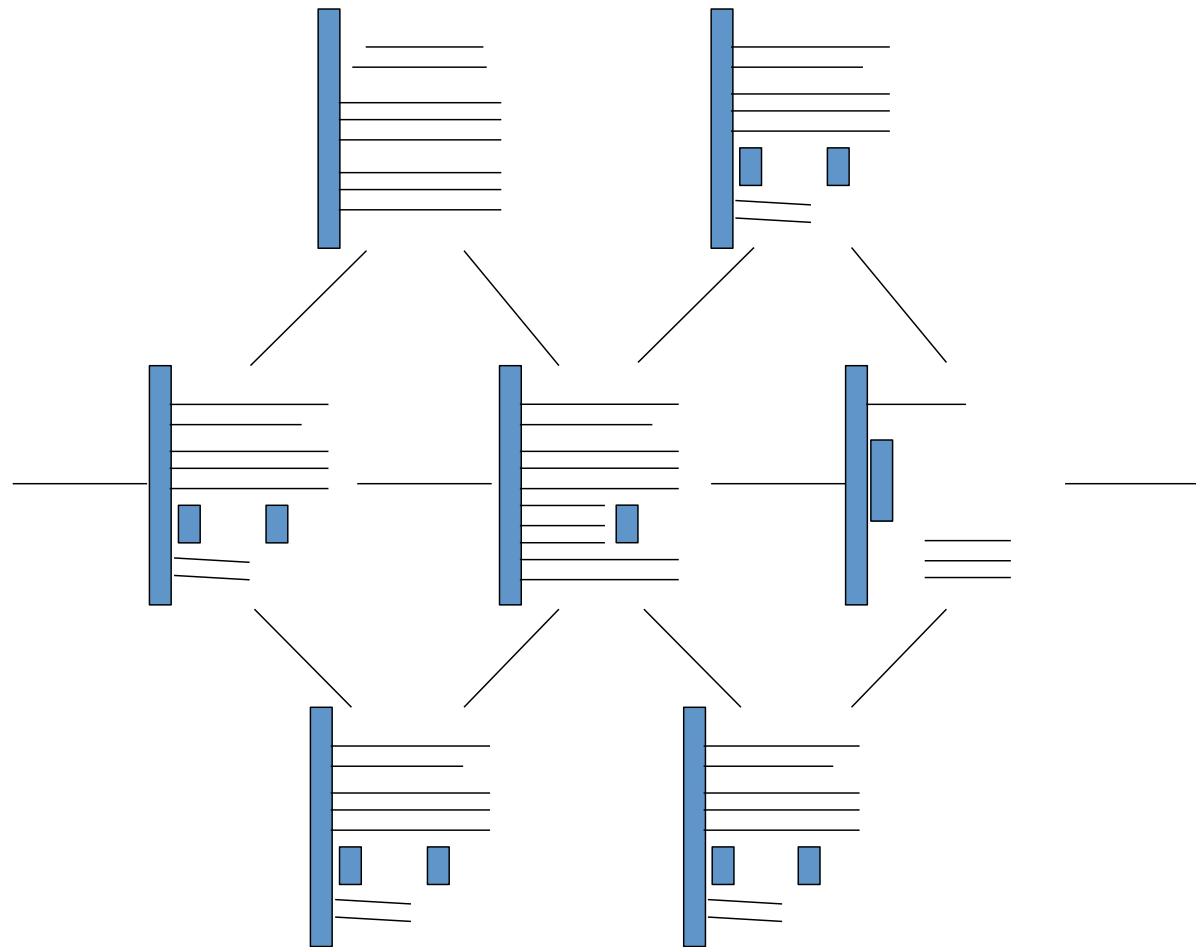
linear with options



guidance
some choices for the user
active interaction
different levels of detail
scenarios: different level of expertise, profiles

Linear Structures IV

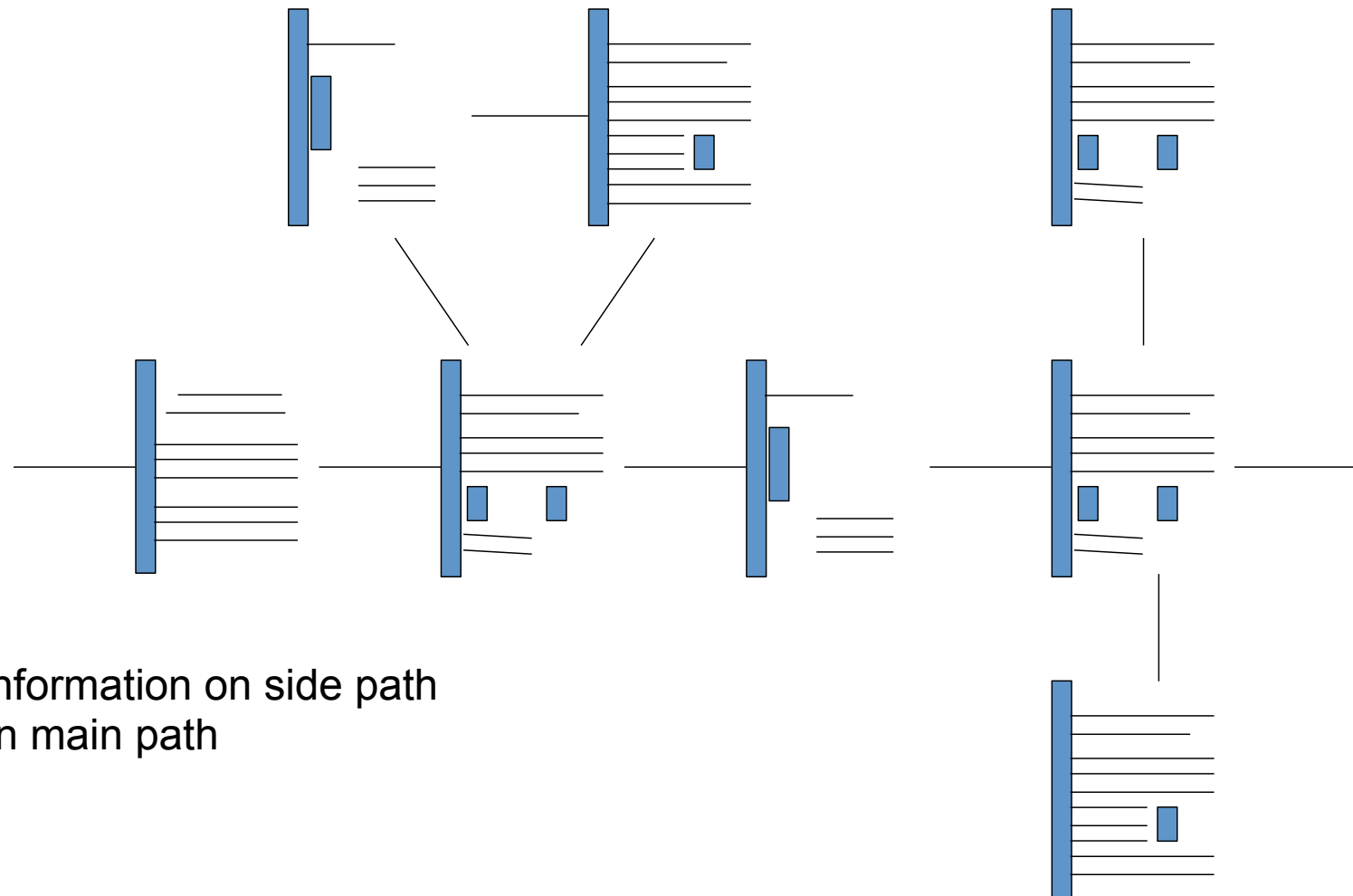
linear with alternatives



guidance
some choices for the
user active interaction
scenarios: questionnaires

Linear Structures V

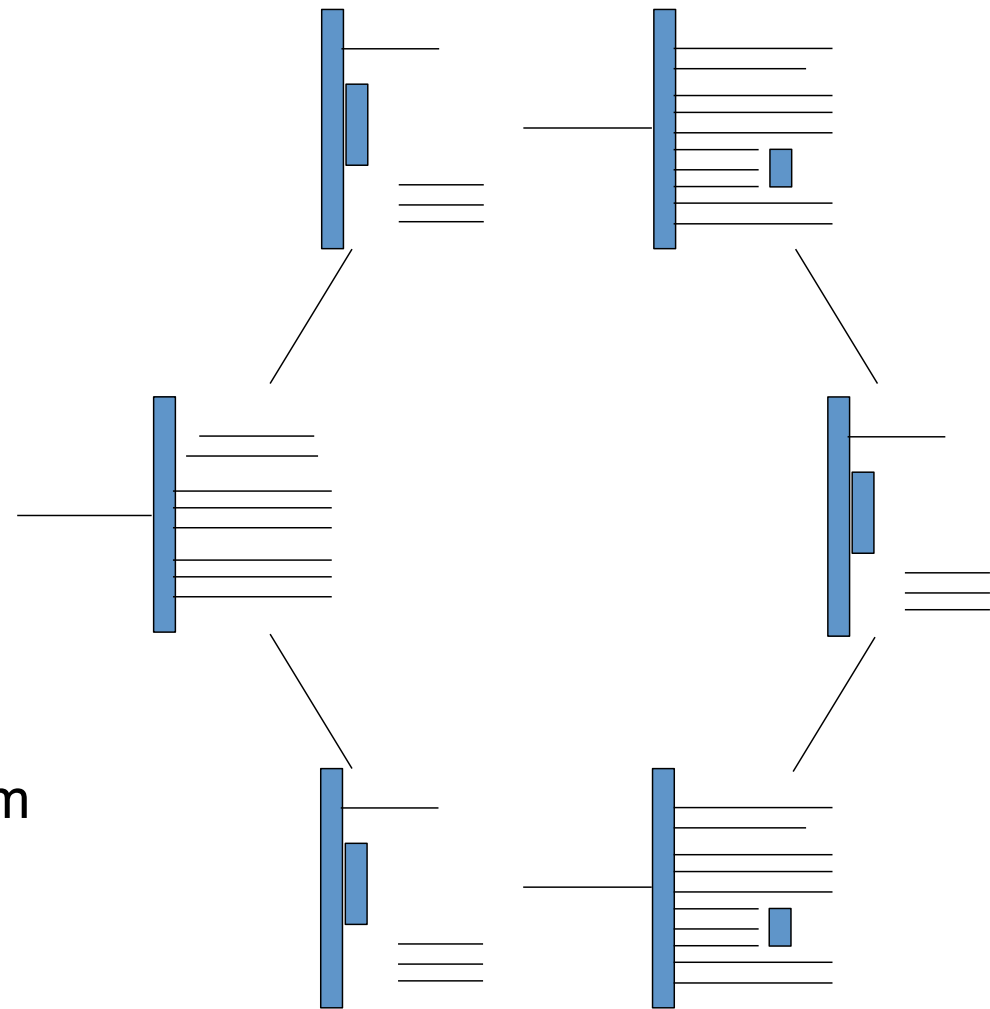
linear with side branches



additional information on side path
guidance on main path

Circular Structure

closed guided path
variants / side paths
entry



E.g. Web Rings
<http://dir.webring.yahoo.com>

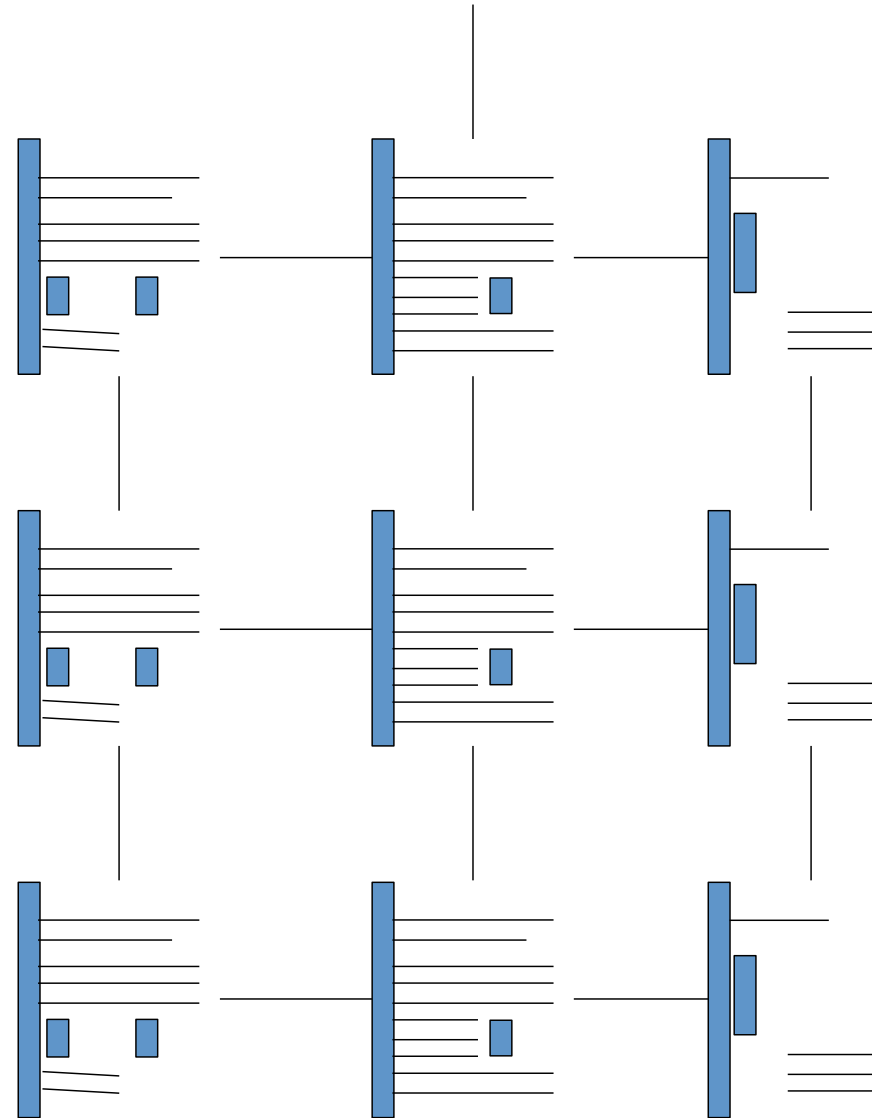
Information Grid

ordered on two
orthogonal criteria

user get a
„feeling of space“

e.g. product catalog

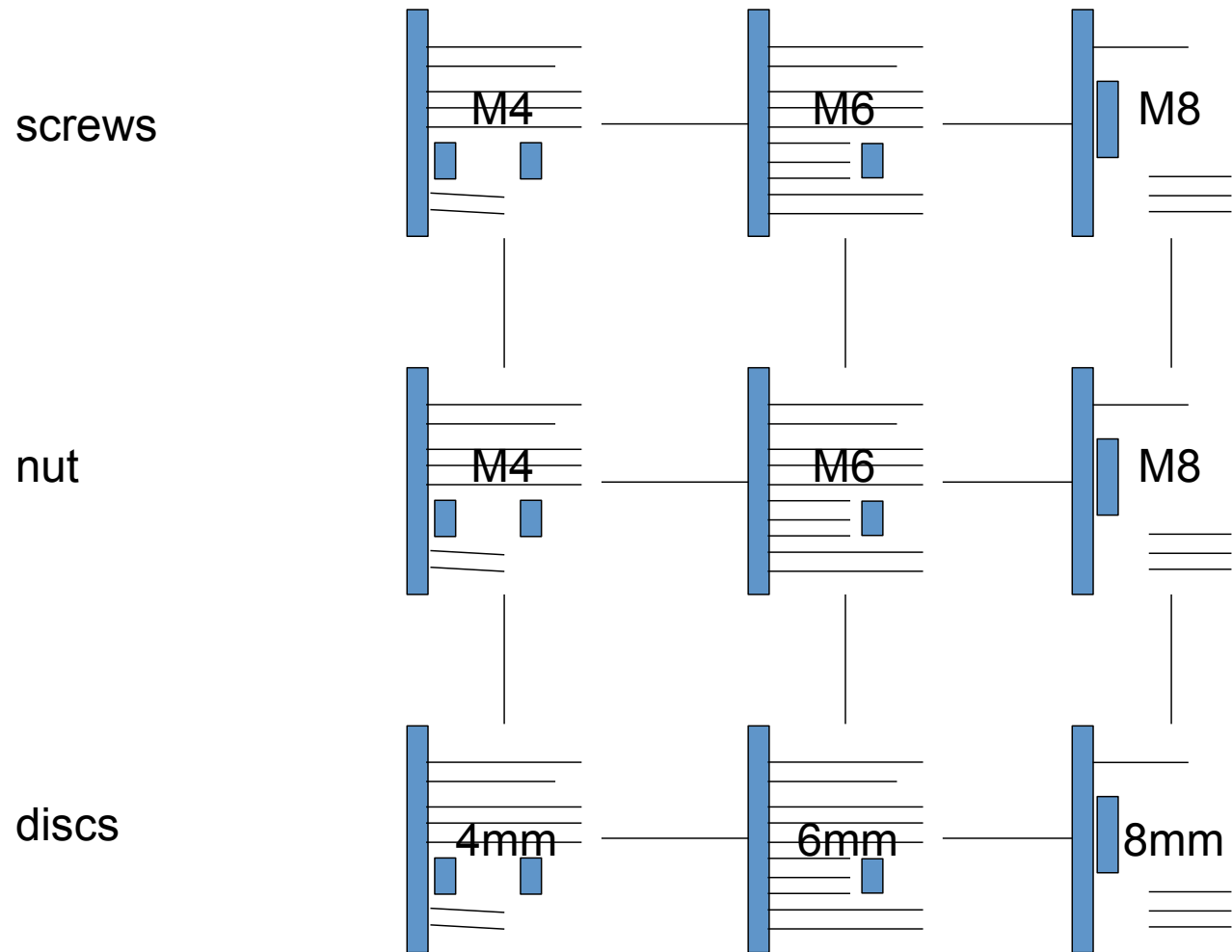
possible for more
dimensions



Example

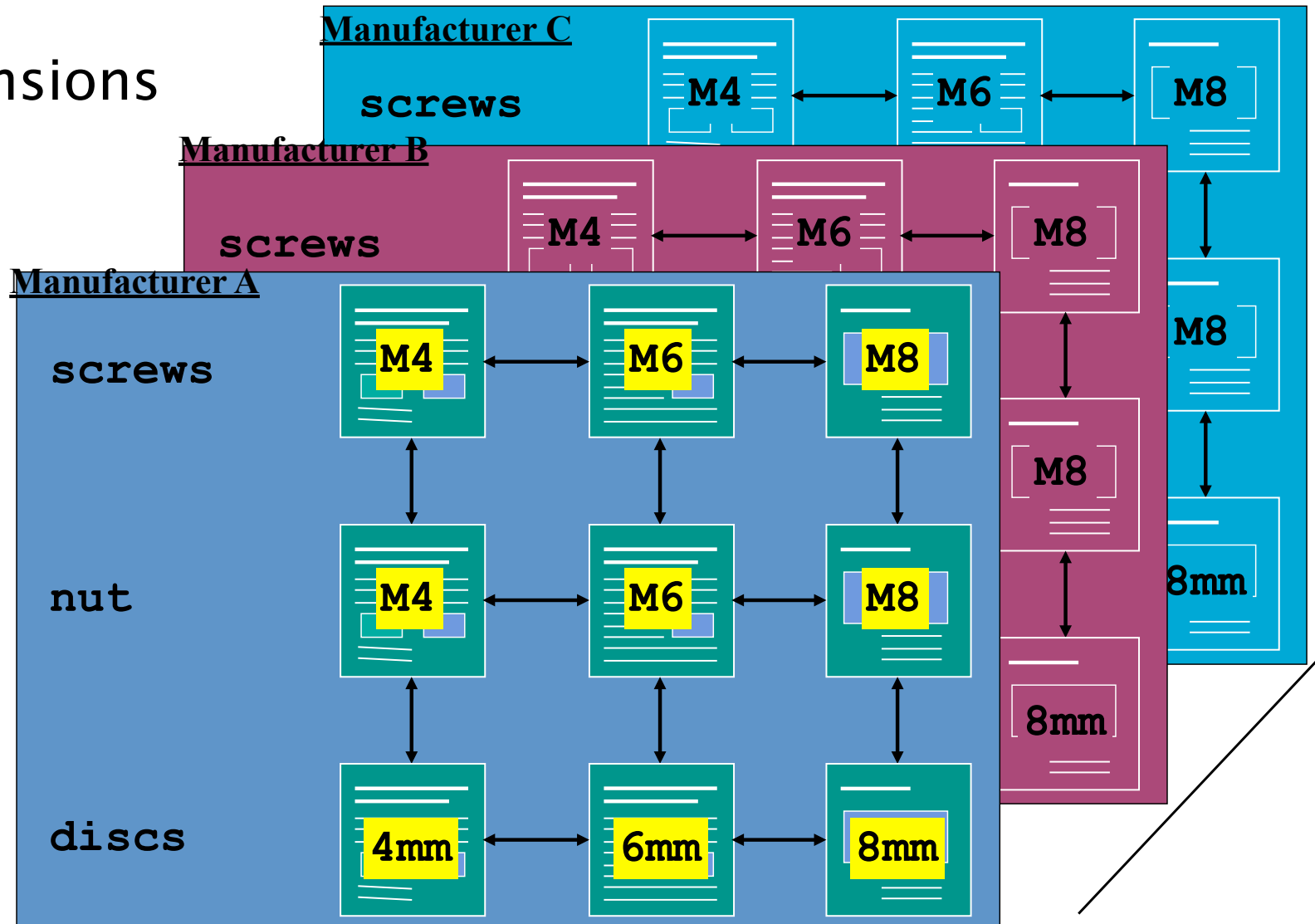
Grid Information Structure I

catalog
2 dimensions



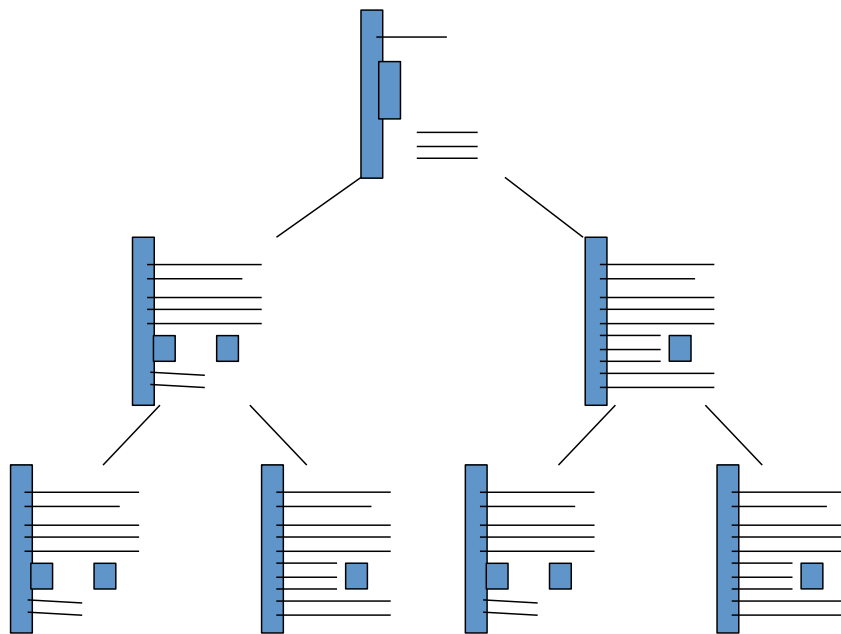
Example

- catalog
3 dimensions



Hierarchical Information Structure

deep hierarchy

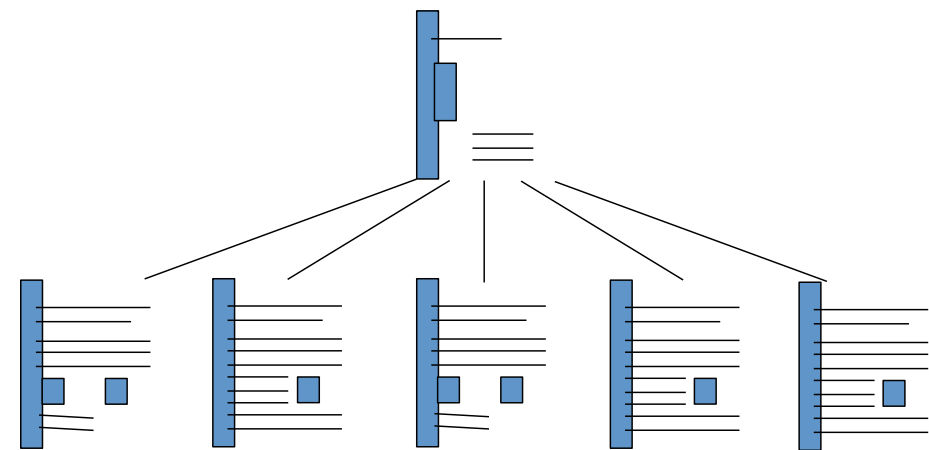


flat hierarchy

Lookup table (A-Z)

6-10 is reasonable

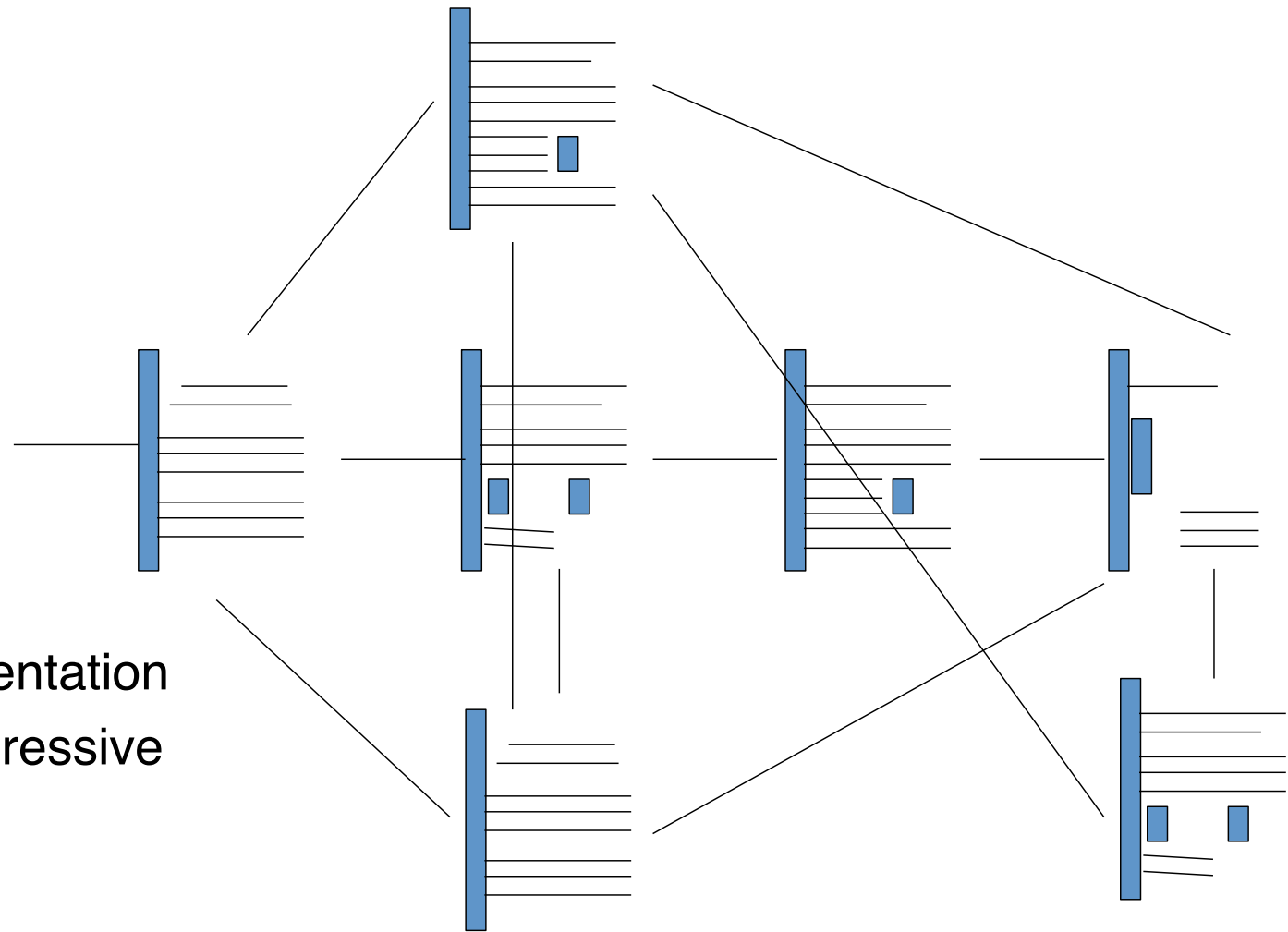
(cognitive psychology)



Linked Information Structures

pure webs

difficult for orientation
extremely expressive



Web Structures

When to use what? - Time to think ...

- Pure linear (directed, undirected)
- Linear with options
- Linear with alternatives
- Linear with side branches
- Circular - closed path
- Information grid
- Hierarchy - deep
- Hierarchy - flat
- Pure webs

References

- Long (1976): Long, J. 1976. Effects of delayed irregular feedback on unskilled and skilled keying performance. *Ergonomics* 19, 2, 183-202.
- Miller (1968): Miller, G. A., Response time in man-computer conversational transactions, *Proc. AFIPS Spring Joint Computer Conference* 33, 1968, 81-97
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- Grossberg, Wiesen, and Yntema (1976): Butler, T. W. 1983. Computer response time and user performance. In *Proc. CHI '83*. ACM, New York, NY, 58-62
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